

SURVEY REPORT

AIR QUALITY SURVEY (TAGA 6000)

DOMTAR CONSTRUCTION MATERIALS LTD.

BRANTFORD

MAY 1989

JULY 1990



Ontario

**Environment
Environnement**

Jim Bradley, Minister/ministre

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DOMTAR CONSTRUCTION MATERIALS LTD., BRANTFORD
MAY 1989

Report prepared for:
West Central Region

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Executive Summary

During the weeks of May 1, 8, and 15, 1989, the mobile TAGA 6000 unit of the Air Resources Branch performed an air quality survey in Brantford, at the request of the West Central Region of the Ontario Ministry of the Environment. The survey objective was to chemically "fingerprint" the odours associated with Domtar's Construction Materials Plant.

The survey crew noted a "roofing tar" odour downwind of Domtar on each monitoring day. The intensity of this odour ranged from slight to strong. The monitoring results indicate that the Domtar Construction Materials Plant was the source of at least three compounds, all of which can be classified as alkylbenzenes. The identified species were xylenes, trimethylbenzenes, and C₄-alkylbenzenes. The half-hour average concentrations were 22-51 $\mu\text{g}/\text{m}^3$ for xylenes, 4.4-8.4 $\mu\text{g}/\text{m}^3$ for trimethylbenzenes, and 2 $\mu\text{g}/\text{m}^3$ for C₄-alkylbenzenes (as ortho-diethylbenzene), in residential areas directly downwind of the Domtar Plant. Air samples, analysed by gas chromatography/mass spectrometry (GC/MS) substantiate the TAGA results. None of the contaminants recorded downwind of Domtar approached the applicable Ministry standards or guidelines.

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1.0 Introduction

At the request of the West Central Region of the Ontario Ministry of the Environment, the Air Resources Branch conducted a mobile air monitoring survey in the vicinity of Domtar Construction Materials, 22 Sydenham St., Brantford, Ontario. The West Central Region expressed special interest in the odours emanating from the manufacture of asphalt shingles in the Domtar plant, which were described by personnel from the Region as resembling "roofing tar". Thus the survey objective was to chemically fingerprint any odours arising from this plant. Mobile Air Monitoring Unit (MAMU) #4, containing a TAGA 6000 mass spectrometer, was used to obtain the chemical fingerprint.

The mobile TAGA 6000 unit is a more advanced version of the TAGA 3000 unit which has been used by the Air Resources Branch for air quality measurements for nearly a decade. The TAGA, or Trace Atmospheric Gas Analyser, possesses the unique capability of real-time monitoring of a broad range of atmospheric contaminants at trace ($\mu\text{g}/\text{m}^3$) levels. An additional stage of mass filtering in the TAGA 6000 provides it with greater specificity than the TAGA 3000.

The Domtar Construction Materials Plant manufactures roofing products such as asphalt shingles, rolled roofing, and adhesives. A brief description of the manufacturing process is found in Appendix A, along with shingle production levels during the survey period.

Presented here is the analysis of air samples acquired downwind of Domtar as determined in the field by the mobile TAGA unit during May 1989.

2.0 The TAGA 6000 "Fingerprinting" Technique

The Trace Atmospheric Gas Analyser (TAGA) model 6000 is a specialised tandem mass spectrometer (MS/MS) with a unique air sampling inlet system and ion source (See Figure 1). Ambient air is sampled directly at a high flow rate (100 l/min.) into the ion source, which operates at atmospheric pressure. Ionisation of trace contaminants is achieved by chemical ionisation (CI) initiated by a corona discharge. Selective ionisation of chemical classes is achieved through addition of the appropriate CI reagent to the flowing air sample. For example, atmospheric water vapour highlights ketones, aldehydes, alcohols and acids, oxygen highlights phenols, chlorophenols and acids, benzene highlights aromatic compounds and sulphurous species, and ammonia highlights amines, amides and some ethers.

The ionisation of pollutants yields a mixture of pseudo-molecular ions which are immediately subject to mass analysis up to 300 amu (atomic mass units). Mass "fingerprinting" is achieved in a matter of minutes. The chemical or pollutant fingerprint arises from the interpretation of all the mass spectra for a given monitoring period. Identifica-

tions made on the basis of this method are tentative, because they are arrived at through considerable interpretation. The identity of compounds present at high enough concentrations (greater than about $1 \mu\text{g}/\text{m}^3$) can be confirmed by use of the second stage of mass analysis to obtain a "daughter ion" mass spectrum. In this technique, the pseudo-molecular ions are collided with an inert gas in the mass spectrometer, with subsequent fragmentation of the ion. The pattern of fragmentation is characteristic of the compound which produced the pseudo-molecular ion. The daughter ion spectra produced in the field may be computer searched against a library of known daughter ion spectra in near real-time, allowing on-site confirmation of pollutant identifications. The ambient air may be screened for classes of pollutants using either a "neutral loss" scan or a "parent ion" scan. For example, it is possible to screen for chlorinated species by monitoring the neutral loss of 35 amu, the mass of chlorine. The presence of methyl ketones could be established by performing a parent ion scan for 43 amu, which is a daughter ion common to all methyl ketones.

2.1 Quantitation of Target Compounds

Accurate quantitation of a target compound can be achieved by calibrating the response of the TAGA to known gas phase concentrations of the target compound. Fragmentation reactions characteristic of the target compound are monitored in "multiple reaction monitoring" (MRM) mode. A typical monitoring period for obtaining quantitative data is thirty minutes; this conforms to the period specified for Ministry standards and guidelines. The instrument is generally calibrated at least twice a day: before monitoring begins, and after it concludes for the day. The instrument is calibrated more frequently in instances where target compound concentrations exceed Ministry standards or guidelines.

Owing to the system's unique features of direct air sampling, and atmospheric pressure chemical ionisation, the technique is highly sensitive to many polar organic compounds in real-time. In general, the TAGA can detect volatile compounds which contain a heteroatom such as N, O, P, S, or halide. The real-time limits of detection for the TAGA range from 0.1 to $10 \mu\text{g}/\text{m}^3$, depending on the type of chemical(s) and the complexity of the sample matrix.

The mobile TAGA unit is equipped with a meteorological station which allows monitoring of wind speeds and wind directions at a height of 10 metres. Meteorological data is simultaneously recorded with any air quality measurements.

2.2 Survey Strategy

The basic survey strategy was to position the TAGA downwind of the source of interest during an odour episode and quickly perform mass spectral analysis of the ambient air. In addition to downwind (source) monitoring, the air monitoring is

performed at locations upwind (background) of the suspected source. The upwind data is used to background correct the downwind measurements.

The selection of monitoring sites is based upon several observations:

- 1) wind direction and wind speed
- 2) plume tracking (real-time target compound measurements while mobile)
- 3) odour characteristics
- 4) type of chemicals detected (fingerprint)
- 5) accessibility and road network

Since the purpose of this study was to identify the odourous components detectable by TAGA, only limited quantitation of the observed compounds was attempted. In addition to TAGA monitoring, 3 litre air samples were collected on solid adsorbent cartridges during two half-hour periods. These samples were subsequently analysed by GC/MS at the Air Resources Branch laboratory, 880 Bay St., Toronto.

3.0 Results and Discussion

The mobile TAGA 6000 unit conducted ambient air monitoring in Brantford on May 1, 2, 3, 4, 8, 9 and 15, 1989. A total of 18 fingerprints of the ambient air were determined at 7 locations downwind of Domtar. Monitoring was conducted in the residential areas to the west, south and east of Domtar (See Map 1). The survey activities are summarised in Table 1, which includes information regarding monitoring periods, sampling locations, local meteorological conditions and relevant comments.

There were several other sources of odour in the immediate vicinity of the Domtar plant including Mott Manufacturing, Canadian Auto Painters (an auto body shop), and the CN rail yard (See Map 1 for locations). However, with careful site selection it was possible to isolate the Domtar plant.

The survey findings are separated into three categories: fingerprint data (Table 2), quantitative half-hour averages by TAGA (Table 3) and quantitative half-hour averages by cartridge-GC/MS (Table 4). When reviewing the data contained in Table 2, Table 3, and Table 4, consider the following:

- 1) Some identifications have been confirmed by MS/MS and by GC/MS: these confirmations are noted in the appropriate table. Some of the compound identities are tentative since they are based on mass spectral identifications.
- 2) Concentrations quoted in Table 2 are only estimates (within a factor of 3) since these scans were conducted principally for compound identification purposes.
- 3) All data were background (upwind) corrected.

4) The TAGA 6000 is not sensitive to all atmospheric constituents – most notably the aliphatic hydrocarbons. The GC/MS technique is sensitive to many of these species, so the two techniques should be seen as complementary.

May 1

This was a sunny, warm day with winds from the NE at 5–10 kmph. Background levels for fingerprint mass spectra were established upwind of Domtar upon arrival in Brantford. Following background sampling, the TAGA unit was moved downwind to a location about 25 metres SW of Domtar (Site A). A slight tar odour was noted by the survey crew at this location. Mass spectral analysis of the ambient air (Fingerprint 1) revealed the presence of xylenes, trimethylbenzenes, and C₄-alkylbenzenes in an estimated concentration range of 1–10 $\mu\text{g}/\text{m}^3$. The identities of these compounds were confirmed by library searches of their daughter ion mass spectra. Common solvents (acetone, cellosolve acetate, butyl cellosolve acetate, cyclohexanone) were detected in an estimated concentration range of 2–7 $\mu\text{g}/\text{m}^3$. These solvents likely originated from Canadian Auto Painters (23 Anne St., see Map 1), which was not represented in the upwind sampling.

May 2

May 2 was a cool, rainy day, with winds from the N–NW at 5–15 kmph, and with moderate to strong tar odours present in the residential area SE of Domtar. Mass spectral analysis at Site B (Fingerprint 2) indicated that only trimethylbenzenes and acetone were detected (instrument sensitivity may have been reduced by high water vapour concentration in the TAGA ion source). The unit was used to "plume track" in the area SE of Domtar, and peak levels of xylenes and trimethylbenzenes occurred directly downwind of Domtar. During an especially strong odour episode the unit was parked on Duke St. (Site I), and Fingerprint 3 was recorded.

May 3

This was a cool and cloudy day with W–NW winds to 30 kmph. Following upwind sampling, the unit was used to plume track to Site C, about 300 metres downwind of Domtar. At this location there was a moderate tar odour. Fingerprint 4, obtained at Site C, contains levels xylenes, trimethylbenzenes, and C₄-alkylbenzenes at an estimated concentration range of 3–15 $\mu\text{g}/\text{m}^3$. The unit was moved to Site D, about 100 metres north of Site C, and Fingerprints 5 and 6 were recorded. At this location the survey crew noted a paint solvent odour mixed with the tar odour. This site was also downwind of Mott Manufacturing, and this plant appeared to be the source of the solvent odour. An analysis of Fingerprint 5 revealed xylenes, trimethylbenzenes and C₄-alkylbenzenes at an estimated concentration range of 5–20 $\mu\text{g}/\text{m}^3$. In addition, the solvents methyl ethyl ketone, cyclohexanone, hexanone, butyl acetate, cellosolve acetate and butyl cellosolve acetate were detected at an estimated concentration range of 1–30 $\mu\text{g}/\text{m}^3$. The wind strength made it difficult to stay in the odourous plume, so the unit was moved to Site E, on the north side of the railroad right-of-way about 400 metres from Domtar. Analysis



of Fingerprint 7 (recorded at Site E) indicated that xylenes and trimethylbenzenes were present at an estimated concentration range of 3–15 $\mu\text{g}/\text{m}^3$.

May 4

May 4 was a sunny, warm day with W–SW winds of 5–20 kmph. Following upwind sampling the unit was moved downwind to Site F, directly across the railroad switching yard from Domtar. Fingerprints 8 and 9 at this location contained levels of xylenes, trimethylbenzenes and C_4 -alkylbenzenes at an estimated concentration range of 1–30 $\mu\text{g}/\text{m}^3$. In addition, polyaromatic hydrocarbons (PAHs) were detected at this location. Naphthalene, methylnaphthalene and either anthracene or phenanthrene (or both) were detected at an estimated concentration range of 1–5 $\mu\text{g}/\text{m}^3$. The identities of xylenes, trimethylbenzenes, C_4 -alkylbenzenes and naphthalene were confirmed at this location by daughter ion MS/MS library searches. Exploration of the switching yard by the survey crew revealed that piles of unused railway ties were evolving naphthalene odours. These ties were upwind of Site E, and are the likely source of the PAHs detected at Site E.

May 8

This was a cool, cloudy day with NW winds of 15–25 kmph. The response of the TAGA to o-xylene, 1,2,4-trimethylbenzene and o-diethylbenzene was calibrated upwind of Domtar. The unit was used to plume track in a large circle (about 1 kilometre diameter) around Domtar. It was found that levels of xylenes and trimethylbenzenes increased only downwind of Domtar. Instantaneous peak levels of 60–65 $\mu\text{g}/\text{m}^3$ for xylenes and 50–55 $\mu\text{g}/\text{m}^3$ for trimethylbenzenes coincided with the tar odour, but not with a solvent odour which was also present downwind of Mott Manufacturing. The unit was parked at Site G, which was downwind of both Domtar and Mott Manufacturing. Analysis of Fingerprints 10 and 11, recorded at Site G, indicated levels of xylenes, trimethylbenzenes and C_4 -alkylbenzenes at an estimated concentration range of 1–200 $\mu\text{g}/\text{m}^3$. In addition, solvents were detected at an estimated concentration range of 1–70 $\mu\text{g}/\text{m}^3$. Through open windows at Mott Manufacturing the survey crew observed workers painting various items; this was the probable source of the solvent odour. Levels of xylenes and trimethylbenzenes were in the range of 20–50 $\mu\text{g}/\text{m}^3$ for xylenes (detection limit=1.1 $\mu\text{g}/\text{m}^3$) and 5–10 $\mu\text{g}/\text{m}^3$ for trimethylbenzenes (detection limit=1.0 $\mu\text{g}/\text{m}^3$) during two half-hour averages between 15:15 – 16:48 (Table 3). Instantaneous peak concentrations were 80–120 $\mu\text{g}/\text{m}^3$ for xylenes and 20–40 $\mu\text{g}/\text{m}^3$ for trimethylbenzenes. These calibrated concentrations are in good agreement with those estimated from fingerprints at the same location. The signals due to C_4 -alkylbenzenes did not meet the quantitation criteria for the calibrated compound (o-diethylbenzene) indicating that a mixture of C_4 -alkylbenzenes was present, at roughly 2 $\mu\text{g}/\text{m}^3$.

May 9

The tar odour could not be detected at any location accessible to the TAGA unit during the day of May 9. At 17:00, after the TAGA unit had been shut down, a slight odour was detected at the corner of St. James St. and Pearl St. Two cartridge samples were taken at this location for subsequent analysis by GC/MS at the Air Resources Branch

laboratory in Toronto. The results are presented in Table 4. All of the major pollutants detected were less than $20 \mu\text{g}/\text{m}^3$. Information provided by Domtar revealed that fibreglass shingles were being produced on May 9. This process is less odorous than asphalt shingle production since hot saturant is not used.

May 15

A partly cloudy and warm day, with wind light out of the E-SE. After upwind monitoring the unit was moved to Site H, about 25 metres NW of Domtar. Fingerprints 12 through 18 were recorded at this location. The tar odour was strong but intermittent, and it was difficult to produce a fingerprint during which the odour was consistently present. For the set of fingerprints recorded at this site, the estimated concentration range was $1\text{--}35 \mu\text{g}/\text{m}^3$.

4.0 Summary and Conclusions

The mobile TAGA 6000 unit conducted an air monitoring survey in Brantford, Ontario on May 1, 2, 3, 4, 8, 9 and 15, 1989, at the request of the Ministry's West Central Region. The purpose of this survey was to attempt to fingerprint the odours associated with the Domtar Construction Materials Plant. The findings of the survey are summarised by the following points.

- 1) Odours resembling roofing tar were recognisable downwind of Domtar. The odours were generally moderate to strong at distances up to about 400 metres. The odours were strong at times in residential areas surrounding Domtar.
- 2) Odours characteristic of paint solvents were discernable downwind of Mott Manufacturing. Due to the proximity of Mott and Domtar, solvents were identified in samples taken downwind of Domtar whenever the wind direction was W-NW.
- 3) The area located between Domtar and the CN rail switching yard was not accessible to the TAGA unit, so the two sources could not be distinguished during periods of SW or NE wind. The survey crew detected naphthalene odours emanating from the CN rail yard at a distance of approximately 10 metres from piles of fresh railway ties.
- 4) The downwind monitoring results indicated that xylenes, trimethylbenzene and a mixture of C_4 -alkylbenzenes were present downwind of Domtar. In addition, plume tracking data indicated that levels of these species increased downwind of Domtar during tar odour episodes. Estimated instantaneous concentrations based on fingerprint data (see Table 2) ranged from 1 to $200 \mu\text{g}/\text{m}^3$ for these species.
- 5) Quantitative half-hour averages produced by the mobile TAGA (see Table 3) on May 8, 1989 indicated that xylene levels were $22\text{--}51 \mu\text{g}/\text{m}^3$ while the levels of trimethylbenzene were $4.4\text{--}8.4 \mu\text{g}/\text{m}^3$ (half hour average concentration).

In conclusion, the survey results indicate that several alkylbenzenes are present at detectable levels downwind of Domtar. Elevated concentrations of these species coincide with tar odours attributed to Domtar, and may contribute to the odour. Cartridge-GC/MS results confirm the presence of xylenes and trimethylbenzene. The concentrations measured by the TAGA and GC techniques are comparable. These results are consistent with the findings of an earlier survey conducted by the MAMU #2 in 1987.¹

After reviewing the odour threshold data (see Table 2 and Table 4) from various sources it would appear that the compounds detected by the monitoring techniques used in this survey were not solely responsible for the odours. There may be contributions to the odour from other species which cannot be detected by either the TAGA or the GC/MS system, or from species of low odour threshold. However, the data does indicate that ambient levels of detected pollutants were not significant in regards to existing Ministry standards and guidelines.

5.0 Acknowledgements

The author wishes to thank Mike Sage (MOE-ARB GC lab) for analysis of cartridge samples, and Gord Takaki (West Central Region, MOE) for assistance in survey preparation and execution. In addition, the author wishes to acknowledge the contributions of the survey crew:

Andy C.W. Ng (MOE)
Greg Koyanagi (Consultant)
Roger S. Mercer (Consultant)
Robert Yeo (Consultant)

¹ *Air Quality Survey in the Vicinity of Domtar Construction Materials Ltd., Brantford, Ontario, MOE-ARB Report ARB-203-87-ARSP, August 1988.*



6.0 Appendix A

Domtar manufactures asphalt rolled roofing, shingles, and adhesives at its Brantford plant. The company produces 2.5 million bundles of shingles annually, based on three shifts daily, and 250 working days per year. Shingle production is considered to be the major source of odour in the plant. Asphalt shingles were produced on May 1–4, and May 15, while rolled roofing was produced on May 8, and fibreglass shingles on May 9.

In shingle production, a felt roll is first placed onto a dry looper. The cellulose base material passes through the saturator, where it is sprayed with hot asphalt on one side, and then impregnated with hot saturant. The saturated sheet enters the coating rolls, where a mixture of 40% coating asphalt (at 230°C) and 60% limestone is applied. Mineral granules of a specific colour are applied to one side, while talc is applied to the other side. The sheet is then passed through a series of rollers to press the granules into the hot sheet, and to cool the sheet. Following further cooling in a water spray the sheet is dried, cut and packaged. Rolled roofing is made by an identical process, but the sheet is not cut. Saturant is not used in fibreglass shingle production.

The plant employs an Andersen 2000 Inc. HEAF (high efficiency air filter) unit for air pollution abatement in the shingle production system. This unit has been shown by Domtar research to be inefficient in reducing odours. All areas of the shingle production system are vented through the HEAF stack, directly out-of-doors. In addition, several frequently open windows in the shingle production area are likely sources of fugitive emissions.

During the survey period, production on the shingle manufacturing line was as follows:

- May 1 to 4
 - produced asphalt shingles
 - normal operation, 3 shifts per day
 - 4700 bundles per shift
- May 8
 - rolled roofing materials
 - same components as the asphalt shingles
- May 9
 - produced fibreglass shingles
 - 3 shifts
 - the saturant process is not used in this case; the shingles go straight to coating
- May 15
 - asphalt shingles (as on May 1–4)
 - 4700 bundles per shift

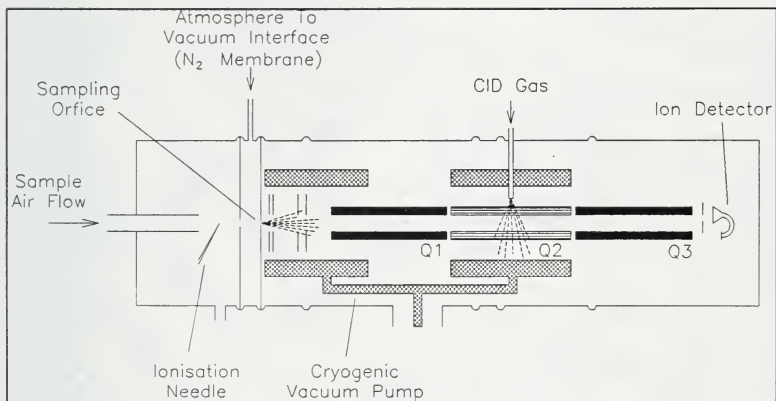
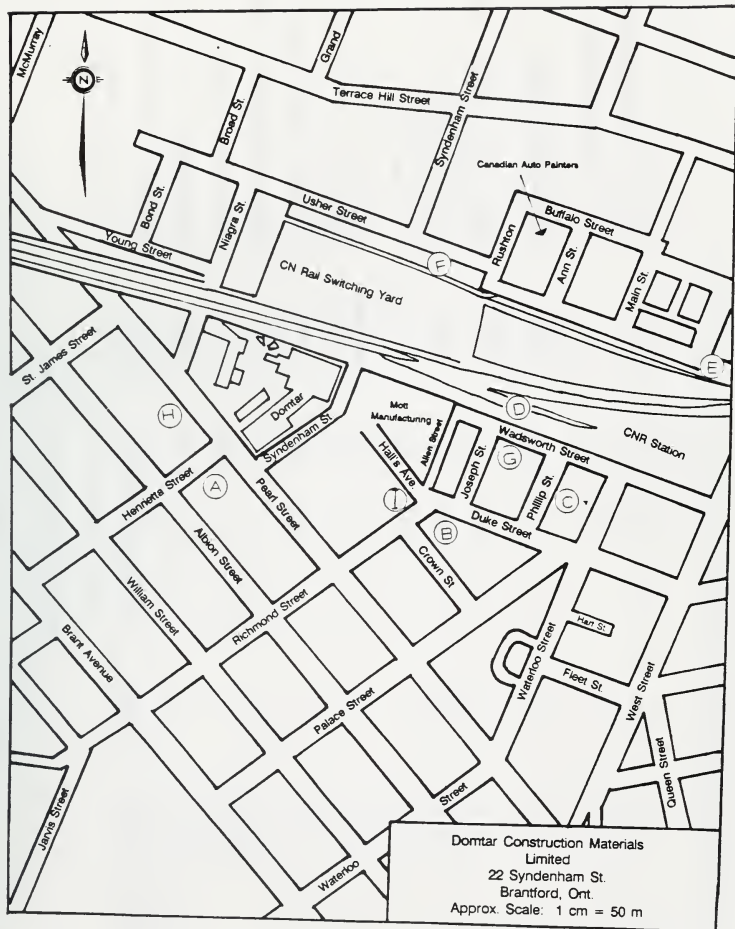


Figure 1 – Schematic of the TAGA 6000 MS/MS System



Figure 1 - Schematic of the T-1000 Office Building



Map 1 – Monitoring Sites for Mobile TAGA Unit

TAGA Monitoring Periods and Locations

Brantford (Domtar) Survey 1989

Date	Fingerprint Monitoring Number	Monitoring Period	Location ¹	Meteorological Conditions ²			Probable Source	Comments
				AT	WS	WD		
May 1	1	14:58-15:11	A	14	5-10	NE	Domtar	Slight tar odour
May 2	2	12:16-12:30	B	10	5-15	NNW	Domtar	Raining, moderate tar odour
	3	13:05	I	-	-	-	Domtar	Parked at roadside, strong tar odour
May 3	4	11:26	C	10	7-10	NW	Domtar	Slight drizzle, moderate tar odour
	5	12:58	D	12	15-20	WNW	Domtar/Mott Manufact.	Slight drizzle, tar + solvent odour
	6	13:01	D	12	15-20	NNW	Domtar/Mott	Tar + solvent odour
	7	14:34	E	13	20-30	W	Domtar	Moderate tar odour
May 4	8	11:44	F	19	5-20	SW-W	Railroad/Domtar	Slight-moderate tar odour
	9	12:10	F	20	5-20	SW-W	Railroad/Domtar	Slight-moderate tar odour
May 8	10	15:02-15:15	G	12	15-25	NW	Mott	Solvent odour, painting at Mott
	11	16:59	G	13	15-20	NW	Mott	Solvent odour, intermittent tar odour

Table 1 - TAGA Monitoring Periods and Locations

TAGA Monitoring Periods and Locations

Brantford (Domtar) Survey 1989

Date	Fingerprint Number	Monitoring Period	Location	AT	WS	WD	Probable Source	Comments
May 15	12	14:49	H	20	5	E	Domtar	Intermittent tar odour
	13	14:56	H	20	5-7	E	Domtar	Intermittent tar odour
	14	15:06	H	19	7	SE	Domtar/ Body shop	Intermittent tar odour
	15	15:10	H	19	7	ESE	Domtar/ Body shop	Intermittent tar odour
	16	15:29	H	18	5	E	Domtar	Moderate tar odour
	17	15:32	H	18	3-5	E	Domtar	Slight tar odour
	18	15:56	H	17	3-5	ENE	Body shop	Slight-moderate tar odour

Notes: 1. See Map 1 for sampling locations

2. Met. Conditions at 10 metres: AT=ambient temperature (°C); WS=range of wind speeds (km/hr); WD=predominant wind direction.

Table 1 Cont'd

Mobile TAGA Odour "Fingerprints"
Target Source: Domtar Construction Materials Plant
Brantford (Domtar) Survey 1989

Compounds Detected ¹ Fingerprint ² # =	Estimated Concentrations ($\mu\text{g}/\text{m}^3$)										
	01	02	03	04	05	06	07	08	09	10	11
xylene ³	1	0	3	6	21	0	14	28	0	190	114
trimethylbenzenes ³	11	5	4	14	13	0	3	15	4	49	4
C ₄ -benzenes (eg. diethylbenzene) ³	4	0	2	3	5	0	0	3	1	8	0
naphthalene ⁴	0	0	2	1	0	0	0	6	3	0	0
methylnaphthalene ⁴	0	0	0	0	0	0	0	1	1	0	0
anthracene or phenanthrene ⁴	0	0	0	0	0	0	0	1	1	0	0
acetone ⁴	7	2	1	0	0	0	0	0	0	1	2
methyl ethyl ketone ⁴	0	0	0	4	46	6	3	9	0	65	9
ethyl acetate ⁴	0	0	0	0	0	0	0	0	0	0	0
hexanone ⁴	0	0	0	0	13	0	0	0	0	19	3
methyl allyl ketone ⁴	0	0	1	0	0	0	0	0	0	2	0
butyl acetate ⁴	0	0	0	0	18	9	0	2	0	4	16
butyl cellosolve ⁴	0	0	0	1	1	0	0	0	0	3	1
cellosolve acetate ⁴	2	0	0	1	33	5	0	6	0	35	5
butyl cellosolve acetate ⁴	2	0	0	0	0	0	0	0	0	0	0
cyclohexanone ⁴	5	0	0	1	27	0	0	5	0	9	23

Table 2 – Mobile TAGA Odour "Fingerprints"

Mobile TAGA Odour "Fingerprints"
Target Source: Domtar Construction Materials Plant
Brantford (Domtar) Survey 1989

Compounds Detected ¹ Fingerprint ² # =	Estimated Concentrations ($\mu\text{g}/\text{m}^3$)										Ministry Criteria ⁵	Odour Threshold ⁶
	12	13	14	15	16	17	18	19	20	21		
xylenes ³	7	7	6	9	32	33	0	2300(s)			3600 ^b	
trimethylbenzenes ³	2	2	2	3	4	5	0	500(g)			700 ^a	
C ₄ -benzenes (eg. diethylbenzene) ³	0	0	3	0	0	0	0	n/a			n/a	
naphthalene ⁴	2	2	2	2	3	3	0	36(pg)			450 ^b	
methylnaphthalene ⁴	0	0	0	0	0	0	0	n/a			n/a	
anthracene or phenanthrene ⁴	0	0	0	0	0	0	0	n/a			n/a	
acetone ⁴	1	1	1	1	1	1	1	4800(s)			40000 ^b	
methyl ethyl ketone ⁴	3	3	1	1	2	1	5	31000(s)			4800 ^b	
ethyl acetate ⁴	0	0	0	0	0	0	0	19000(s)			n/a	
hexanone ⁴	1	1	0	1	0	0	1	1200(g)			6300 ^b	
methyl allyl ketone ⁴	1	1	2	1	0	1	0	n/a			n/a	
butyl acetate ⁴	1	1	1	2	0	0	2	735(pg)			1000 ^b	
butyl cellosolve ⁴	1	1	1	1	0	0	0	350(pg)			1900 ^b	
cellosolve acetate ⁴	0	0	0	0	0	0	2	220(pg)			480 ^b	
butyl cellosolve acetate ⁴	0	0	0	0	0	0	0	500(pg)			6500 ^b	
cyclohexanone ⁴	2	2	2	3	1	0	0	n/a			n/a	

Notes: 1. Identifications based on interpretation of APC/MS, except xylenes, trimethylbenzene and naphthalene confirmed by MS/MS.

2. See Table 1 for monitoring periods and locations.

3. Probable source is Domtar

4. Probable source is other than Domtar includes railroad yard and painting at other industries.

5. In $\mu\text{g}/\text{m}^3$, (s)=O.R. 308 standard, (g)=EASCC guideline, (pg)= provisional guideline

6. In $\mu\text{g}/\text{m}^3$, population perception threshold.

a. *Compilation of Odour Threshold Values in Air and Water*, van Gemert L.J., ed., National Institute for Water Supply, Voorburg, Netherlands, 1977

b. *Procedure for the Determination of Odour Impact Models by the Binary Port Method*, Ontario Ministry of the Environment, Report # AMP-143, Draft #10, Feb 1989.

Table 2 Cont'd

Time ¹	Monitored Compounds	Location	Concentrations		DL ⁴
			Average	Peak ³	
15:15 to 15:45	xylene	Downwind ²	22	77	1.1
	trimethylbenzene		8.4	43	1.0
	C ₄ -alkylbenzenes ⁵		2.4		1.1
16:18 to 16:48	xylene	Downwind ²	51	126	1.1
	trimethylbenzene		4.4	18	1.0
	C ₄ -alkylbenzenes ⁵		1.7		1.1
18:11 to 18:21	xylene	Upwind ⁶	2.8		
	trimethylbenzene		1.9		
	C ₄ -alkylbenzenes ⁵		0.9		

1. Data collected on May 8, 1989.

2. Downwind location, Wadsworth St. opposite Brantford Naval Veterans Club.

3. Peak instantaneous concentration during half-hour average.

4. Detection limit based on 3 x standard deviation of background (upwind) signal.

5. Based on 1,2-diethylbenzene

6. Upwind location, opposite 153 Pearl St., near Henrietta St.

Table 3 – Mobile TAGA Quantitative Half-Hour Averages by MS/MS MRM

Compound Detected	Concentration ($\mu\text{g}/\text{m}^3$)		Ministry Criteria ³	Odour Threshold ⁴
	Run #1 ¹	Run #2 ²		
Propane	7.8	6.0	n/a	2.2×10^7 ^a
2-Methylpropane	4.3	4.3	n/a	1.37×10^7 ^a
Butane	9.5	9.6	n/a	3×10^6 ^a
2-Methylbutane	8.6	9.9	n/a	n/a
Pentane	4.2	4.5	n/a	3.5×10^5 ^b
2-Methylpentane	3.9	3.9	n/a	n/a
3-Methylpentane	2.1	2.7	n/a	n/a
Hexane	2.8	4.6	35000(g)	1.65×10^5 ^b
Methylcyclopentane	0	1.6	n/a	n/a
Benzene	14	17	**	29000 ^a
2,2,4-Trimethylpentane	0	2.2	n/a	n/a
Toluene	12	11	2000(s)	600 ^b
Octane	1.0	0	45400(pg)	61800 ^c
Ethylbenzene	1.8	1.8	4000(s)	400 ^b
Xylenes	6.9	6.9	2300(s)	3600 ^c
Styrene	2.9	0	400(s)	1300 ^c
1,2,4-Trimethylbenzene	1.6	1.5	500(g)	700 ^b
Naphthalene	1.6	0	36(pg)	450 ^c
Total	84	87		

Notes: 1. Corner of Pearl St. and St. James St., May 9, 16:20–16:50, slight odour.

2. Corner of Pearl St. and St. James St., May 9, 16:58–17:28, slight odour.

3. In $\mu\text{g}/\text{m}^3$, (s)=O.R. 308 standard, (g)=ESSAC guideline, (pg)=provisional guideline.

4. In $\mu\text{g}/\text{m}^3$, population perception threshold.

** Currently under review.

a. Verschueren, K., *Handbook of Environmental Data on Organic Chemicals*, 2nd Edition, Van Nostrand Reinhold, New York, 1983.

b. *Compilation of Odour Threshold Values in Air and Water*, van Gemert L.J., ed., National Institute for Water Supply, Voorburg, Netherlands, 1977.

c. *Procedure for the Determination of Odour Impact Models by the Binary Port Method*, Ontario Ministry of the Environment, Report # AMP-143, Draft #10, Feb 1989.

Table 4 – Cartridge–GC/MS Quantitative Half-Hour Averages

